

## ATMOSPHERIC SOUNDER FOR IMPROVING STAND-OFF SURFACE AND NEAR-SURFACE SENSING

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Spectroscopic remote sensing of surface or near-surface phenomena through the Earth's atmosphere is complicated by the distortions produced by the absorptions and emissions in the intervening atmosphere. The accuracy and sensitivity of such observations can be greatly improved if the atmospheric interferences are properly accounted for. Because of the disparate spectral and spatial resolution requirements coupled with the bandwidth requirements, it is not cost-effective to design a stand-off surface or near-surface sensor to provide its own atmospheric correction. This function, nonetheless, can be accomplished with a compact cryogenically cooled spectroradiometer, using a curved grating and operating in the  $7\text{ }\mu\text{m}$  spectral region. It is possible to acquire sufficiently accurate temperature and humidity profiles by sensing in the  $1200\text{ to }1400\text{ cm}^{-1}$  spectral region. With readily achievable spectrometer and focal plane temperatures of  $150\text{ K}$  and  $70\text{ K}$ , respectively, it is possible to achieve a signal-to-noise ratio of 300 or better with a spectral resolution of approximately  $1.0\text{ cm}^{-1}$ . This is sufficient to achieve an atmospheric correction in the  $800\text{ to }1200\text{ cm}^{-1}$  region with an accuracy on the order of  $0.1\text{ K}$ . A modular spectroradiometer of this design could be added as a bore-sighted atmospheric sounder to surface, or near-surface, stand-off sensors to enhance their sensitivity and accuracy.